UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

SDMS Document ID
2003585

ACCESS AGREEMENT

PROPERTY ADDRESS:
3652 WILLIAMS ST.

Mailing Address (If Different than Property Address):

I will allow Environmental Protection Agency (EPA) staff and EPA's authorized representatives to have access to my property identified above for the purpose of collecting soil samples. I understand that this service is provided at no cost to me.

I understand that this soil testing is part of an investigation of possible metals contamination in soils in the north Denver area. EPA is conducting this investigation as part of its responsibilities under the Comprehensive Environmental Response, Compensation and Liability Act, a law also referred to as "Superfund".

Yolanda Ortega
Print Name

8/3/99
Date

Yolanda Ortega
Signature

295-6610
Phone Number

Please check the following if applicable:
___ I would like EPA to provide me with a portion of the sample, called a "split sample," that I may have analyzed at my own expense.

If you have any questions, please contact Ted Fellman at (303) 312-6119, or Marta Valentine from the Morrison Knudsen Corporation (EPA's contractor) at (303) 948-4693.

Your Comments:

PLEASE SIGN AND RETURN THIS ACCESS AGREEMENT TO OUR CONTRACTOR:
Morrison Knudsen Corp., Attn: VBI70, 10822 W. TOLLER DR., LITTLETON, CO 80127.
Soil sampling will take about 1 hour. The owner or resident need not be present. If you would like to be notified when we plan to sample your property, please state so in the Comments section and provide your phone number. Also, pet owners are asked to provide a phone number so that if necessary we may schedule the sampling at a time when the pet will be indoors or restrained. Thank you for participating in this important study of your neighborhood.

NOTE: If you are not the current property owner, and you are not a renter who wishes to forward this request to the owner, pleas e state so in the Comments section and return this agreement unsigned.

08/05/99 ah

E-732

Risks due to soil gas intrusion depend on location (both within a Lot and between Lots) because of differing levels of contaminants in the underlying soil, on the assumed type of building constructed (basement or slab-on-grade), and on the use of the building (commercial or residential). All calculations in this memo focus on a slab-on-grade building used for residential purposes, since this is the scenario which yielded the highest risks in the risk assessment. Evaluations were performed for Lots 3, 4, 5, and 8, since these are the only locations where current risks are predicted to exceed a level of concern. As in the risk assessment, two different scenarios were considered for the location where the building was placed within a Lot: either at a location where concentration values in soil were typical (average) for the Lot, or at a location where the underlying concentrations were maximum for the Lot.

Depth Profiles

Data are too sparse to define soil depth profiles of VOCs with certainty, but most contaminants do not appear to show a strong dependency on depth. Therefore, it was assumed that the vertical concentration pattern of all VOCs in soil is uniform (i.e., the soil is equally contaminated from the surface to the groundwater). Groundwater was assumed to occur at a depth of 30 m (about 100 feet).

Chemicals of Concern

Based on the risk assessment, only five COPCs contribute significantly to a potential human health risk in indoor air. These chemicals are:

- 1,2,4-Trimethyl benzene
- 1,3,5-Trimethylbenzene
- cis-1,2-Dichloroethylene
- Hexane
- Naphthalene

Table 2 summarizes the current concentrations of these chemicals in soil at Lots 3, 4, 5, and 8, along with the predicted concentrations of the VOCs in indoor air and the associated non-cancer health risk to residents.

Specification of Acceptable Soil Concentration Levels

There are several different approaches for specifying acceptable concentrations of these VOCs in soil at the site.

Option 1: Uniform Soil Concentration (Single Chemical)

The most basic type of PRG is the average concentration of a chemical that would have to be achieved throughout the entire soil column beneath a building in order for that individual chemical to yield an HQ of 1E+00. Conceptually, these values are calculated by solving the risk equation to find the indoor air l concentration which corresponds to a target risk level of 1E+00, and then using the Johnson and Ettinger model to find the soil concentration which corresponds to the target air concentration. In practice, because both the risk model and the Johnson and Ettinger models are linear, the soil PRG can be derived from the original risk estimates simply by dividing the starting soil concentration by the resulting HQ (see Table 2):

Soil PRG (ppm) = Soil Concentration (ppm) / HQ

The resulting values are shown below:

VOC	Soil PRG (ppm)	Indoor Air (ug/m3)	RME HQ
1,2,4-Trimethylbenzene	1.10	6.2	1.0E+00
1,3,5-Trimethylbenzene	0.70	6.2	1.0E+00
cis-1,2-Dichloroethene	0.70	36.4	1.0E+00
Hexane	0.73	210	1.0E+00
Naphthalene	20.90	3.14	1.0E+00

This is the highest acceptable concentration for each chemical in soil (based on the assumptions of the Johnson and Ettinger model).

Option 2: Uniform Soil Concentration (Multiple Chemicals)

When more than one chemical is present in soil, the level of some or all of the chemicals must be lower than the corresponding single-chemical PRGs (above) so that the sum of the risks does not exceed the target (HQ = 1E+00). There are many different ways that the individual chemical concentrations can be reduced to achieve this goal. One common way is to assume that remedial action will cause the concentrations of all chemicals to be reduced by the same relative amount (i.e., the chemicals will remain in constant proportion). Based on this assumption, the PRGs for each chemical at each Lot are calculated simply by dividing the soil concentration at each location by the HI value for the location:

Soil PRG (ppm) = Soil Concentration (ppm) / HI

Because the relative concentrations of the different COPCs vary from location to location, the PRGs also depend on location. The results for Lots 3, 4, 5 and 8 are shown in Table 3. As above, this is the concentration of each chemical, averaged over the entire soil column, needed to meet a target HI of 1E+00 at that location.

Option 3: Non-Uniform Soil Concentration (Multiple Chemicals)

An alternative approach to achieving acceptable levels of VOCs in indoor air is to remove VOCs from the soil starting at the surface and proceeding down to a depth such that the remaining source material remaining at depth does not contribute unacceptable levels to a building at the surface. In this approach, the "PRG" takes the form of a depth to which soil must be remediated (e.g., by excavation or by soil vapor extraction) rather than a concentration value in soil.

As noted above, starting soil concentration levels of VOC were assumed to be uniform from the surface down to the groundwater (a depth of about 30 m). Likewise, soil type was assumed to be uniform (sandy loan) from the surface to groundwater. Concentrations in remediated soil were assumed to be zero. Figure 1, calculated using the SL-ADV Johnson and Ettinger model, shows how the concentration of a VOC in indoor air decreases as a function of the depth of soil that is remediated. As seen, the pattern varies somewhat from chemical to chemical (depending of the physical properties of each chemical), but the reduction in indoor air is generally equal to or somewhat less than the fraction of the source material excavated. That is, if half of the source is excavated or remediated, the reduction in indoor air will be a factor of ½ or less. Thus, a screening level estimate of the depth of excavation/remediation needed to achieve a reduction from the starting HI to the target HI (1E+00) is given by:

Depth of excavation/remediation ≥ Total depth / HI

A somewhat mor accurate estimate may be derived by taking the average of the chemical-specific curves shown in Figure 1, and determining the depth at which the fractional reduction in indoor air concentration (the value on the y-axis) is equal to a value of 1/ HI. The necessary depth is then read of the x-axis. Table 4 summarizes the results based on this approach, showing the approximate depth (m) and volume (m^3) of soil that would have to be excavated or remdiated in order to reduce indoor air concentrations to an acceptable level (HI = 1E+00).

Table 1. Summary of Model Input Parameters

Parameter	Value	Basis
Concentration in source (soil, water)	Chemical and location specific	Site data
Depth below grade to bottom of enclosed space floor	15 cm 200 cm	Model default for slab-on-grade building Model default for structure with basement
Depth below grade to top of soil contamination	15 cm 200 cm	Slab on grade scenario Basement scenario
Average soil temperature	10°C	Model default
Vadose zone SCS soil type	Sandy loam	Site specific data (Washington Group 2001d)
Vadose zone soil dry bulk density	1.5 g/cm^3	Assumed value for sandy loam
Vadose zone soil total porosity	0.43	Assumed value for sandy loam
Vadose zone soil water-filled porosity	0.10 cm^3/cm^3	Conservative estimate
Vadose zone soil organic carbon fraction	0.002	Mean of site-specific data for depths greater than 5 feet (Washington Group 2001d)

TARGET SHEET
EPA REGION VIII
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1000352

SITE NAME: INTERMOUNTAIN WASTE OIL

DOCUMENT DATE: 06/17/2002

DOCUMENT NOT SCANNED
Due to one of the following reasons:

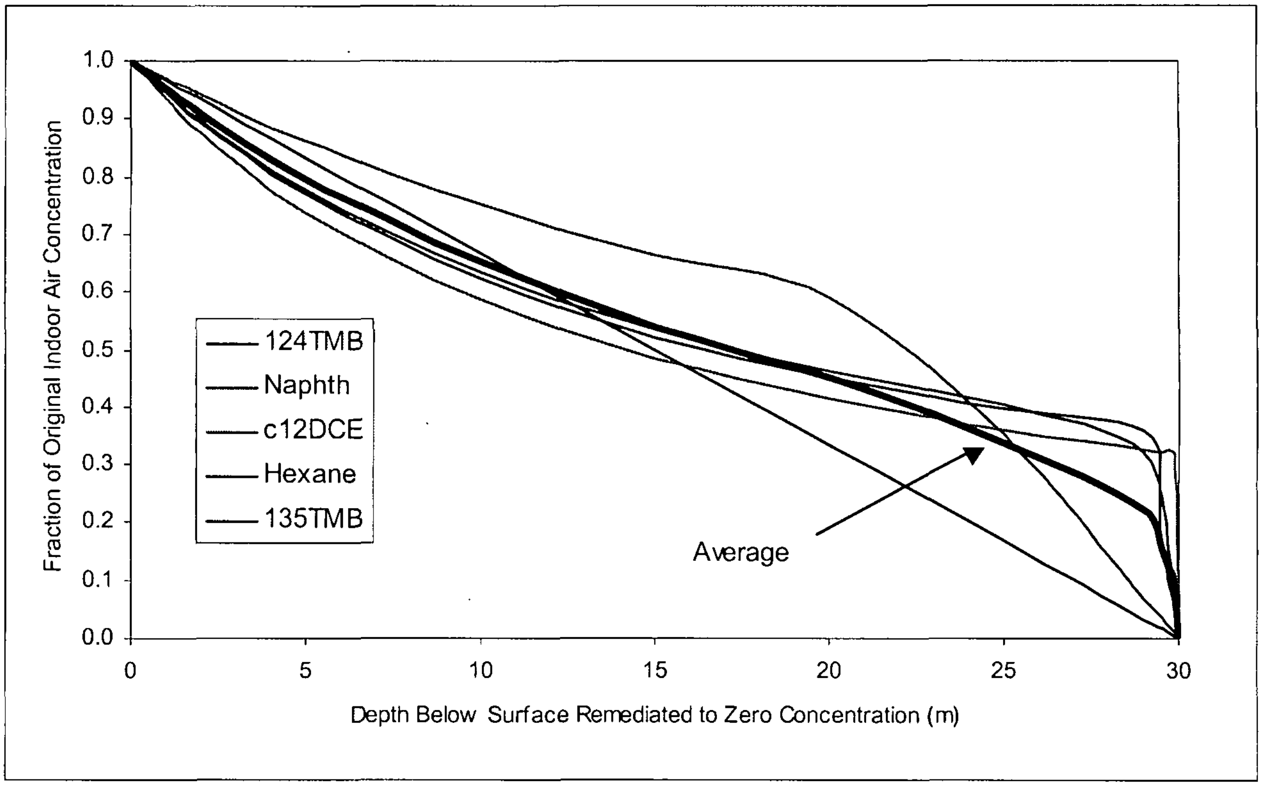
- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☐ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ✓ TYPES OF DOCUMENTS NOT ~~TO BE~~ SCANNED
(Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

TABLE 2 - Summary of VOCs of Potential Concern in Soil
TABLE 3 - Location-Specific PRGs Based on Proportional Reduction
TABLE 4 - Depth of Soil Remediation Required to Achieve Health-Based Target

Contact the Superfund Records Center to view available document.
(303) 312-6473

Figure 1. Effect of Surface Soil Remediation on Indoor Air Concentrations



This spreadsheet is a screening level tool for estimating the depth of soil that would require excavation or remediation to address human healthg concern from VOCs intruding from soil into indoor air. Inputs are the HI value at the location before remediation, and the depth "d" to clean soil. It is assumed that the depth profile is uniform from the surface to depth "d", and that all VOCs have the same depth profile. It is also assumed that the relationship between fractional volume remediated and risk reduction is linear.

depth to clean soil	HI Value Before Remediation								
	2	3	4	5	6	8	10	15	20
10	5.0	6.7	7.5	8.0	8.3	8.8	9.0	9.3	9.5
20	10.0	13.3	15.0	16.0	16.7	17.5	18.0	18.7	19.0
30	15.0	20.0	22.5	24.0	25.0	26.3	27.0	28.0	28.5
40	20.0	26.7	30.0	32.0	33.3	35.0	36.0	37.3	38.0
50	25.0	33.3	37.5	40.0	41.7	43.8	45.0	46.7	47.5
60	30.0	40.0	45.0	48.0	50.0	52.5	54.0	56.0	57.0
70	35.0	46.7	52.5	56.0	58.3	61.3	63.0	65.3	66.5
80	40.0	53.3	60.0	64.0	66.7	70.0	72.0	74.7	76.0
90	45.0	60.0	67.5	72.0	75.0	78.8	81.0	84.0	85.5
100	50.0	66.7	75.0	80.0	83.3	87.5	90.0	93.3	95.0